

7.—The Agamid Lizards of the Genus *Tympanocryptis* in Western Australia

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Seven species and subspecies inhabiting Western Australia (including *parviceps* sp. nov.) are described and their distribution outlined. The relationships between *centralis*, *tetraporophora* and *lineata* are discussed. Doubt is raised whether the genus is natural. The key includes all known species and subspecies of *Tympanocryptis*.

Introduction

The genus *Tympanocryptis*, like *Nephrurus* (Storr 1963), is most diversified in the more arid parts of Australia; and being equally difficult to collect, the discovery of its various species has been similarly protracted. Three species were described in the second half of the nineteenth century, but no more were added until Mitchell (1948) revised the genus and proposed several new taxa. The purpose of this paper is to describe yet another species, to amend the current concept of certain taxa, and to bring up to date our knowledge of the variation and distribution of all Western Australian members of the genus.

In the descriptions of species and subspecies diagnostic characters have been printed in bold-face type. Unless stated to the contrary, all material examined is lodged in the Western Australian Museum, and all localities are in this State. Since two species (*tetraporophora* and *uniformis*) are herein recorded from Western Australia for the first time, it is quite possible that other eastern taxa will be found here; accordingly *maculosa*, *intima*, and *pinguicolla* (all of Mitchell 1948) have been included in the key.

Genus *Tympanocryptis* Peters

Type (by monotypy): *T. lineata* Peters, 1864, Mber. Akad. Wiss. Berlin 1863: 230.

Diagnosis. Distinguishable from all other Australian Agamidae by the absence of an external ear opening.

Description. Small, terrestrial, cryptozoic and somewhat sluggish lizards with a greatly or moderately depressed head, body, and tail. The limbs, head, and tail are relatively small. The dorsal scales are heterogeneous, consisting mostly of small, smooth or keeled scales, mixed with tubercles, i.e., large scales, more or less raised and usually keeled, spinose, or mucronate. A gular fold always and a dorso-lateral fold sometimes present. Most species lack femoral pores. Pre-anal pores usually two but absent from females of most taxa.

Distribution. Endemic to Australia, where it is absent only from the east coast and southwest corner of the continent. There are seven known species, five of them occurring in Western Australia with a joint range from the Kim-

berley Division south to the northern Wheat-Belt, the Eastern Goldfields, and the Great Australian Bight.

Key to Species and Subspecies

1. Dorsal tubercles conspicuous, more or less raised, with or without keels, spinose or mucronate 2
Dorsal tubercles inconspicuous, flat and smooth *maculosa*
2. Rows of scales between nasal and labials, 4-8 3
Rows of scales between nasal and labials, 2-3 *parviceps*
3. Dorsal tubercles clumped in transverse and oblique ridges 4
Dorsal tubercles isolated 5
4. Tail bands sharply oblique, usually narrower than pale interspaces *cephala gigas*
Tail bands almost transverse, much wider than pale interspaces *cephala cephalo*
5. Conspicuous dorsal pattern; neck almost as wide as or wider than head 6
Moderate or obscure pattern; neck much narrower than head 7
6. Neck slightly narrower than head; South and Western Australia *lineata lineata*
Neck slightly wider than head; southern Victoria *lineata pinguicolla*
7. Dorsal tubercles irregularly distributed 8
Tubercles tend to be in four longitudinal rows *intima*
8. Hind-leg about as long as trunk *tetraporophora*
Hind-leg considerably shorter than trunk 9
9. Eye almost completely hidden from above by bowed-out supraciliary ridge *lineata centralis*
Eye protrudes from below straight supraciliary ridge *uniformis*

Tympanocryptis lineata lineata Peters

Tympanocryptis lineata Peters, 1864, *supra cit.*
Near Adelaide, South Australia.

Material examined. R 14184 (10 miles NE of Fraser Range HS.), R 17418 (12 miles SW of Balladonia), R 12222 (12 miles W of Naretha), R 19101-4 (Naretha), R19105-10 (Seemore Downs), R 15209 (Rawlinna), R 16502 (Forrest).

Description. Moderately stout and depressed. Sides of neck puffed out almost to width of head. Supraciliary ridge moderately acute and (viewed from above) only slightly bowed outwards and not concealing the somewhat protrusive eyes. Facial trough not deep or angular. Snout-vent length of largest specimen (R 19103, a gravid ♀) 65 mm.

Rostral 2-3 times as wide as first labial. Mental truncate polygonal or elliptical, deeper than wide, and usually narrower than rostral. Upper labials 12-15. Nasal approximately heptagonal, flat or slightly convex, the moderately large oval nostril piercing it towards the top and entering forwards and downwards, and separated from the labials by 4-5 rows of tectiform scales.

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- ▲ LINEATA LINEATA
- △ LINEATA CENTRALIS
- X TETRAPOROPHORA
- PARVICEPS
- UNIFORMIS
- ◐ CEPHALA CEPHALA
- CEPHALA GIGAS

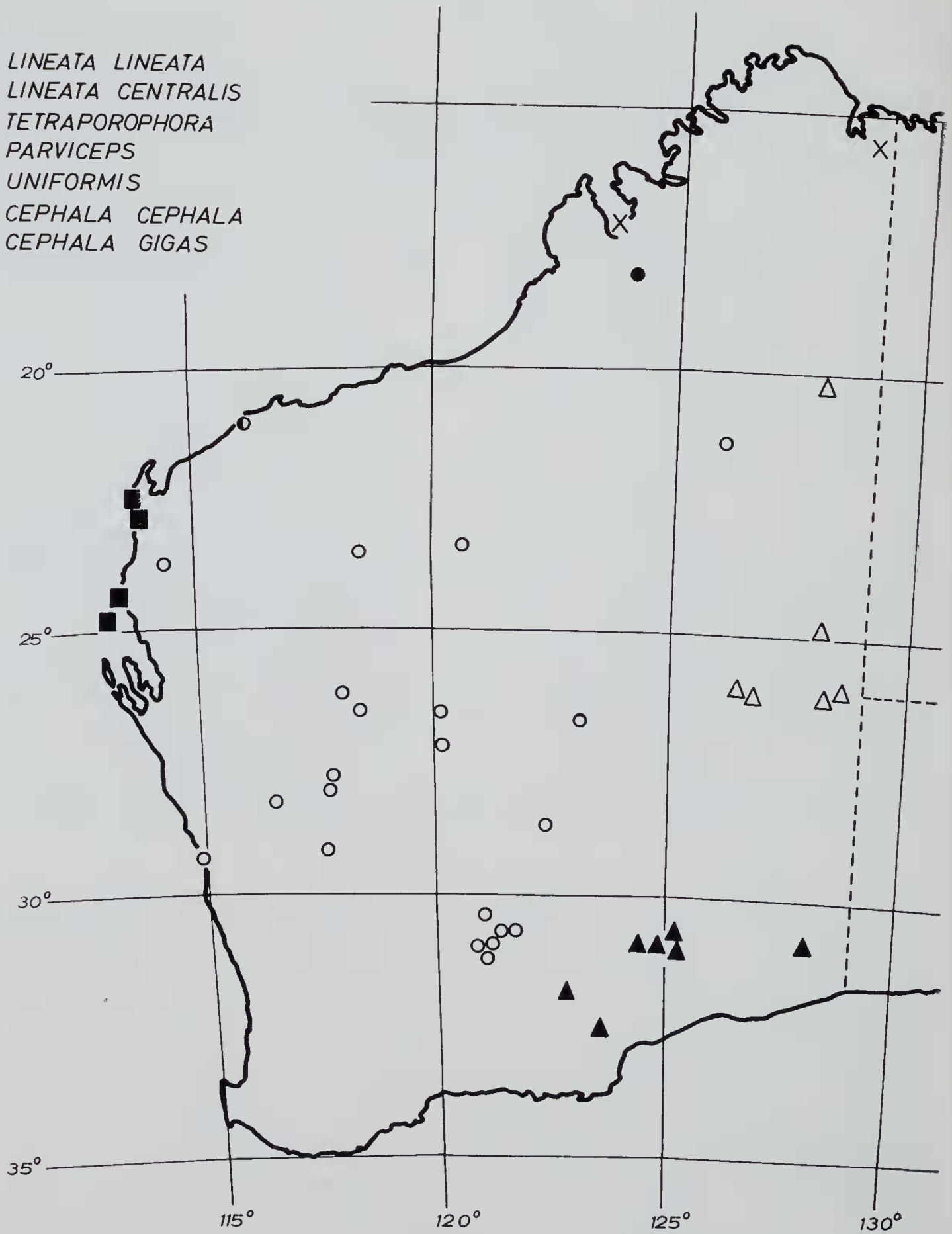


Fig. 1.—Map of Western Australia, showing location of specimens of *Tympanocryptis*.

Scales on top of head strongly keeled, usually unicarinate but occasionally multicarinate or rugose, smallest above the temples and supraciliary ridge. Scales on nape small and bluntly keeled, becoming larger and more strongly keeled on back, where they are mixed with scattered tubercles, i.e. scales that are enlarged, raised, sharply keeled and mucronate. Tubercles are absent from the longitudinal white lines and tend to be sparse in the space between the dark transverse bands. There are some tubercles on the base of the tail, but distally the scales are more uniform, their keels aligned longitudinally. Scales on upper surface of limbs (like tail) large and strongly keeled; on the under surface smaller and feebly keeled.

Gulars and ventrals smooth. Palms and soles covered with small, imbricate, bluntly keeled scales. Lamellae under fourth toe 18-22, spinose and sharply bicarinate. Claws relatively short. Pores in both sexes, 2 pre-anal and occasionally a small one on thigh.

Dorsal ground colour fawn. Five prominent silvery grey or white longitudinal lines running back from neck; of these the vertebral is much the widest (4 times as wide as the dorso-laterals) and, like the laterals, ends at the level of the pelvis; the dorso-laterals reach the proximal third of tail. These lines dilate as they cross over dark chocolate-brown bands (a broad one across neck, 4 narrower ones across body, and 12-17 indistinct ones on tail) and may become brownish where they cross the pale interspaces. The transverse bands are widest where they contact the vertebral line. The squares bounded by the transverse bands and the vertebral and dorso-lateral lines are somewhat paler and less reddish than the corresponding spaces between the dorso-lateral and lateral lines. Upper surface of limbs, like tail, vaguely banded with chocolate-brown. A short dark chocolate transverse bar in front and a short longitudinal bar to each side of interparietal. A pale transverse bar from orbit to orbit, with an ill-defined dark bar immediately in front of it. Under surface whitish except for grey or black flecking on chin, chest or abdomen (these dark scales, especially on chin, may be arranged in broken, more or less longitudinal lines).

Distribution. South-eastern Western Australia west to Fraser Range and east through southern South Australia to north-western Victoria where it begins to intergrade with the south Victorian race *pinguicolla* (Mitchell 1948).

Tympanocryptis lineata centralis Sternfeld

Tympanocryptis lineata centralis Sternfeld, 1924. Abh. Senckb. Naturf. Ges. 38: 234. Hermannsburg Northern Territory (M. von Leonhardt).

Material examined. R 21861-4 (Balgo Hills Mission), R 15141-3 (Warburton Range Mission), R 15696 (20 miles E of Warburton Range Mission), R 20988 (western pass, Blackstone Range), R 20746 (Blackstone Mining Camp), R 20757-8 (Pass of the Abencerrages, Rawlinson Range), R 21454-6 (Tennant Creek, Northern Territory), R 20925 (Victory Downs, Northern Territory).

Description. More slender than nominate race, with narrower neck and shorter tail and limbs. When viewed from above, supraciliary ridge more strongly bowed outwards and con-

cealing more but not all of eye. Snout-vent length of largest specimen (R 21456, a gravid ♀) 61 mm.

Rostral less than twice as wide as first labial. Mental usually deeper than wide and narrower than rostral. Upper labials 10-14.

Head scales more uniform in size and less strongly keeled than in nominate race, especially in vicinity of interparietal where they may be quite smooth. Supratemporals not markedly smaller than neighbouring scales. Dorsals more heterogeneous than in nominate race, with a greater contrast between the smooth or slightly keeled, weakly imbricate small scales and the sharply keeled, spinose tubercles.

Gulars and ventrals weakly keeled. Lamellae under fourth toe 15-21, mostly unicarinate, becoming bicarinate distally. Claws, especially those of fingers, much longer than in nominate race, and the longest in the genus. Two pre-anal and occasionally a small femoral pore (pores are seldom discernible in females).

Coloration darker (reddish or purplish brown) and less strongly patterned than in nominate race. The longitudinal lines, especially the laterals, may be obscure or absent. When present, the vertebral line is only twice (not four times) as wide as the dorso-laterals.

Distribution. Hills of the far eastern interior of Western Australia, east into the Northern Territory and probably north-western South Australia (R 20925 was taken about a mile north of the South Australian border).

Comments. Loveridge (1934) wrote, "the grounds on which Sternfeld based this race are somewhat slender". They certainly were, for one of his two characters was invalid, viz. that *centralis* has a much longer tail than typical *lineata*. Sternfeld had no specimens of the latter and relied on the imperfect description in Boulenger (1885). Mitchell (1948) went so far as to relegate *centralis* to the synonymy of *lineata lineata*. Yet *centralis*, as the foregoing description shows, differs consistently and markedly from *lineata*, which occurs only 300 miles to the south and is quite uniform throughout its extensive range in the south-east of this State and, judging from Mitchell's photographs and descriptions, in southern South Australia.

I have hesitated to include in *centralis* a specimen (R 13222) from Giles. More material is required before deciding whether the discrepancies between it and *centralis* are due to its youth (snout-vent length 25 mm.) or are characteristic of another but undescribed taxon. There is no indication of longitudinal white lines; and the dorsal tubercles are large, obtusely keeled, not spinose or even mucronate, and tend to be aligned longitudinally. It is thus similar in some respects to the two specimens from the northern MacDonnell Ranges, described briefly by Mitchell (1948, p. 70).

Tympanocryptis tetraporophora Lucas & Frost

Tympanocryptis tetraporophora Lucas & Frost, 1895. Proc. Roy. Soc. Vic. 7: 265. Adminga, South Australia (W. Baldwin Spencer).

Material examined. R 11752 (Kimberley Research Station, Ord River), Macleay Mus. R 930 (King Sound), National Mus. D 7701 (holotype).

Description. Relatively slender with a narrow head and long legs. Tail long, tapering gradually. Supraciliary ridge acute and (viewed from above) fairly straight in outline and almost wholly concealing eye. Rostral ridge acute. Facial trough shallow and rounded (R 930) or deep and angular (R 11752). Snout-vent length of largest specimen (R 930, a presumed ♀), 63.5 mm.

Rostral 3-4 times as wide as high, wider than polygonal mental, about equal to combined width of first two labials. Nasal situated on or below rostral ridge, elliptical or rounded polygonal, convex, pierced a little above its centre by the large elliptical nostril which enters forward, and separated from labials by 4-5 rows of facials. Upper labials 11-15, increasing in size backwards, tectiform or keeled, and as large as or larger than adjacent facials.

Scales on top of head mostly with a strong keel, sometimes tricarinate or rugose, smallest above orbits, and largest on occiput and temples. Scales on nape small, strongly imbricate, keeled or spinose, becoming larger on back where they are irregularly mixed with tubercles, i.e. larger, raised scales which are strongly keeled and spinose. Extreme base of tail has scattered tubercles, not much larger than the sharply keeled, mucronate ordinary scales. Scales on upper surface of limbs large, sharply keeled, and mucronate or spinose.

Scales on chin keeled, becoming larger, mucronate and more strongly imbricate on throat. Ventrals large, imbricate, keeled and mucronate. Subcaudals similar in size to supracaudals but less strongly keeled, not spinose and only slightly mucronate, the keels aligned longitudinally. Scales on palms and soles strongly imbricate, raised, and trispinose (the central spine much the highest). Lamellae under fourth toe 19-21, bicarinate and trispinose (the outer spine much the smallest and not arising from a keel). Claws moderately long. Pores in males only, 2 pre-anal.

Head and back brownish grey, becoming paler on distal half of tail. Indistinct brown bands across back, narrowly broken by the vertebral and dorso-lateral lines which, being little paler than the ground colour, are scarcely discernible. Several caudal bands, of which the first 2-4 are darkest and least obscure. Limbs paler than back, not or vaguely banded. Under surface whitish, with or without brown flecking.

The above description is based on the two Kimberley specimens, which differ as much among themselves as from the type, which I have been able to examine through the courtesy of Mr. J. McNally, Director of the National Museum, Melbourne. The rostral is higher in the type, so that it is only twice as wide as high and no wider than the mental. The obtuse rostral ridge is swollen around the nasal, which is separated from the labials by 6-7 rows of facials. Most of the head scales in the type have one or more small pits near their posterior edge.

Distribution. Restricted in Western Australia to the Kimberley Division. (Owing to past confusion of this species with *lineata*, it is not possible to ascertain from the literature its distribution beyond this State. It probably extends

from the Kimberleys south and east through the Northern Territory to far northern South Australia.)

Comments. Lucas and Frost founded this species mainly on its possession of femoral pores. A year later (1896) they virtually retracted it after discovering, as I have done, that *lineata* too may have femoral pores. Nevertheless, *tetraporophora* is a recognisable taxon, differing from *lineata* in having little colour pattern, a more slender habitus, and considerably longer limbs. The only question is whether it or *centralis* represents *lineata* in central Australia. Only one of them can be regarded as a race of *lineata*, for they are almost certainly sympatric over a large part of the Northern Territory (they may however be ecologically separated, for *centralis* has only been found among rocks). I have retained *centralis* as a race of *lineata*, because of its greater similarity in colouring. It is interesting that *centralis* and *tetraporophora* diverge from *lineata* in opposite directions with respect to length of limbs.

Tympanocryptis parviceps sp. nov.

Holotype. R 16984 (in Western Australian Museum), an adult ♂ collected by G. M. Storr and B. T. Clay on October 18, 1962.

Type Locality. Eleven miles south-east of Ningalco, Western Australia, in 22° 48' S, 113° 49' E.

Paratypes. R 19095-6 (2 miles N of Ningaloo); R 8833, R 13221, R 13483, R 19094 (Point Cloates); R 19097-8 (Quobba); R 10654, R 11265-70, R 13164, R 20494-5 (Bernier Island).

Description. Body relatively slender, moderately depressed. Head small, not greatly wider than neck. Fore-legs short, hind-legs long. Supraciliary ridge acute and (viewed from above) bowed outward and concealing most of eye. Rostral ridge continuous with supraciliary ridge and similarly acute. Facial trough deep and angular. Chin terraced, i.e. the plane of the chin, instead of curving gradually round the ventro-lateral corner of jaw changes abruptly along a straight line running obliquely back from each side of mental (see Figure 2). A small but distinct dorso-lateral fold. Snout-vent length of largest specimen (R 19094, a ♀) 46.5 mm.

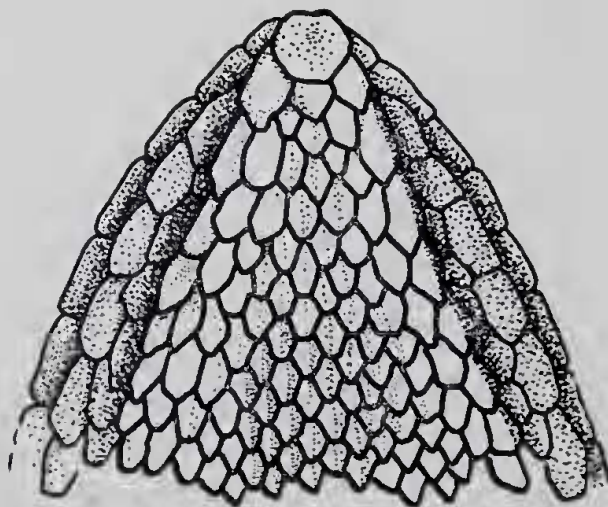


Fig. 2.—Ventral surface of head of *T. parviceps* illustrating the "terracing" of chin. Drawn by Miss R. Hunt.

Rostral much wider than high, about equal to combined width of first two labials, and wider than the hexagonal or truncate polygonal or elliptical mental, which is nearly as wide as deep. Upper labials 8-12, keeled, much smaller than the facials immediately above them. Nasal large, situated well below rostral ridge and extending to bottom of facial trough, rounded polygonal, flat or slightly concave, pierced towards its top by an elliptical nostril which enters downwards and forwards, and separated from labials by 2 (sometimes 3) rows of facials, the upper row small and smooth, the lower large and keeled.

Scales on top of head strongly keeled, largest in the frontal and interparietal regions, smallest above the supraciliary ridge and on the occiput where they become rugosely conical. Scales on nape small but strongly keeled. Scales in wide strip down middle of back uniform, slightly raised, strongly keeled and weakly spinose. Dorso-laterals vary greatly in size, the smallest being little larger than the nuchals. Caudals similar to but larger than median dorsals. Scales on upper surface of limbs similar to median dorsals.

Scales on chin weakly keeled, becoming higher and subspinose on throat. Ventrals large and mucronate on chest, becoming smaller and weaker on abdomen. Scales on under surface of limbs similar to those on chest. Scales on palms and soles flat and weakly keeled. Lamellae under fourth toe 18-23, bicarinate and bispinose (the outer spines much the smaller). Claws slender and moderately short. Pores in ♂♂ only, 26-34 (8-10 pre-anal, 16-25 femoral).

Dorsal ground colour pale brownish grey, palest and tending to fawn on the median dorsal strip (where all the scales are uniformly large). The dark brown on sides of body and tail extends on to dorsum in the form of narrow hourglass-shaped bars, broken by the pale median strip. Limbs not or vaguely banded with brown. Under surface whitish except for grey or black marbling on chin and throat.

Distribution. Mid-west coast of Western Australia from Ningaloo south to Quobba and Bernier Island.

Comments. This is the most distinctive species in the genus, and its belated description has been due to its confusion with *Amphibolurus adelaidensis* rather than to its restricted distribution. Within its range it is apparently plentiful, especially at Point Cloates where several specialists in other animal groups have incidentally collected *parviceps*.

Lacking an external ear opening and a lateral line of tubercles on the base of tail, *parviceps* should never have been mistaken for *adelaidensis*. Nevertheless their similarity is more than superficial; for these two species, alone among the Agamidae I have examined, possess a "terraced" chin. In view of this and of similarities in colour pattern and dorsal scalation, they are believed to be more closely related to each other than to any species in the genus to which they are at present assigned.

Tympanocryptis uniformis Mitchell

Tympanocryptis uniformis Mitchell 1948, Rec. S. Aust. Mus. 9: 76. Near Darwin, Northern Territory (P. Wesselmann).

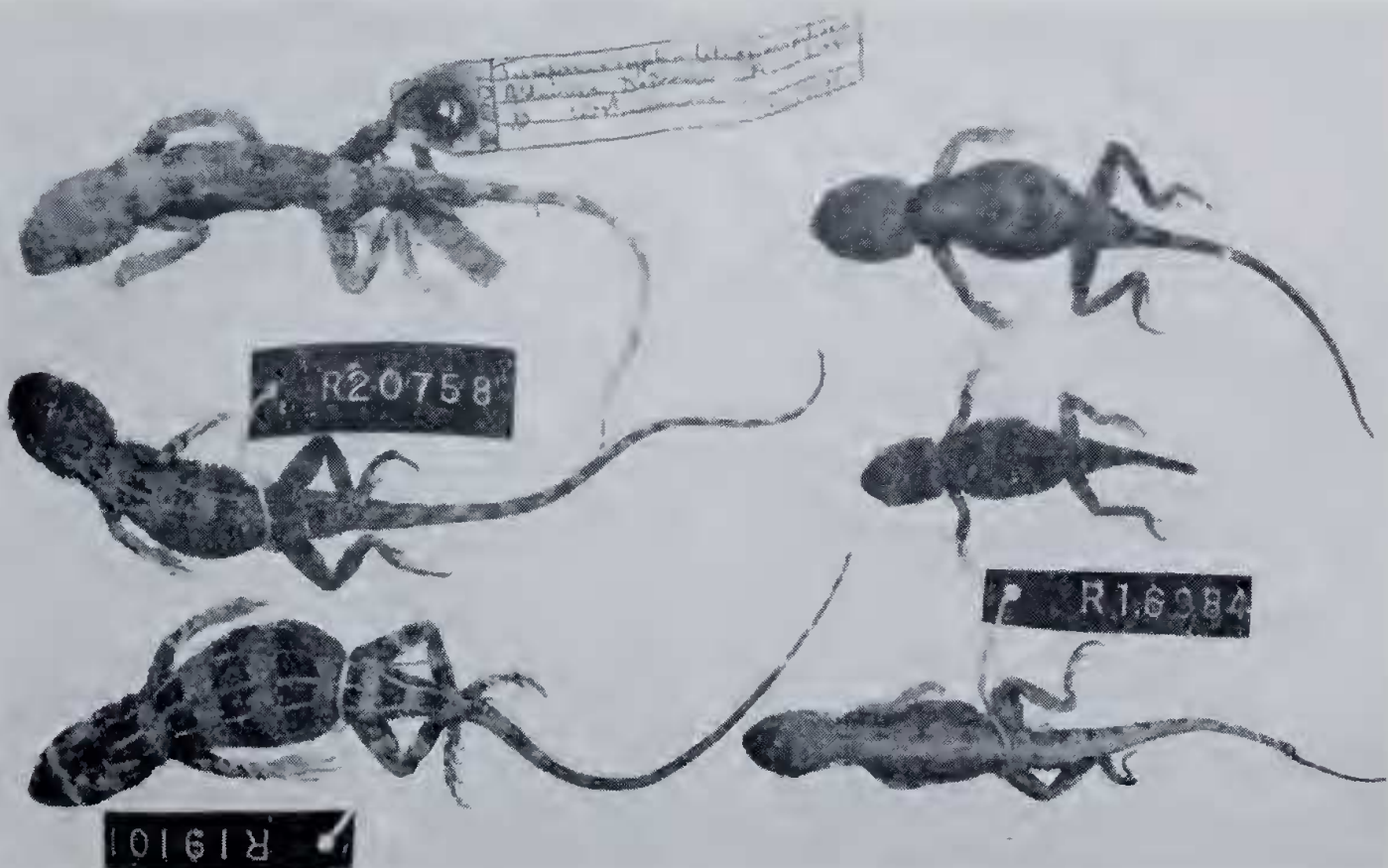


Fig. 3.—Left (top to bottom): *Tympanocryptis tetraporophora*, *T. l. centralis*, and *T. l. lineata*. Right (top to bottom): *T. cephalo gigas*, *T. uniformis*, and *T. parviceps*.

Material examined. R 13638 (20 miles SE of Luluigui, West Kimberley).

Description. Body moderately depressed. Head large. **Snout short, sloping steeply in profile.** Limbs small. **Tail tapering rapidly** (as in *T. cephalus*). Supraciliary ridge acute and (viewed from above) straight in outline and not concealing the **very protrusive eyes.** Rostral ridge obtuse. Facial trough shallow but angular.

Rostral a little more than twice as wide as high, slightly wider than combined width of first two labials, and a little wider than the truncate elliptical mental. Upper labials 15, increasing in size backwards, and considerably smaller than the facials immediately above them. Nasal situated on swollen rostral ridge, rounded polygonal, convex, pierced towards its top by a small circular nostril which enters downwards and forwards, and separated from labials by 5-6 rows of facials.

Scales on top of head strongly keeled anteriorly, becoming rugose posteriorly, smallest above supraciliary ridge, largest prefrontally and around interparietal. Dorsals weakly imbricate, weakly keeled, mucronate, and sparsely mixed with isolated tubercles (enlarged, slightly raised, unicate scales, their keel terminating in a short spine or mucro), which are highest on sacrum. The largest tubercles tend to be aligned in four longitudinal rows, two on each side of dark vertebral stripe, which consists of two rows of uniform black scales, slightly larger and more strongly imbricate and keeled than other dorsals. Tubercles extend to base of tail, which is otherwise covered above with keeled mucronate scales, and below with non-imbricate scales whose keels are aligned more regularly. Scales on upper surface of limbs more strongly keeled. Two highly spinose scales towards posterior edge of thigh.

Scales under head mostly smooth and weakly imbricate. Ventrals largest on chest and tending to be striate or weakly keeled. Scales on lower surface of limbs much smaller and less strongly keeled than those above. Scales on palms and soles still smaller but more sharply keeled, distally becoming spinose, especially on palm. Lamellae under fourth toe 16-18, strongly bispinose, except proximally where the outer spines are scarcely discernible. Claws short and stout. No pores.

Dorsal ground colour grey. Body and tail crossed by darker grey bands (of uniform width and as wide as interspaces), one across neck and four across body, all of them only slightly darker than ground coloration and thus barely discernible. Caudal bands darker and more prominent, at least on proximal half of tail. More conspicuous than the body bands is a dark grey or black vertebral strip from occiput to rump. Much fainter are a dark discontinuous dorso-lateral and lateral line, discernible only where they cross the transverse bands. Limbs pale greyish brown, obscurely banded with darker brown. Entire under surface white except for pale greyish brown flecking round jaws.

Distribution. From the Kimberley Division of Western Australia east into the Northern Territory.

Comments. The above description is of specimen R 13638, collected by Prof. C. L. Camp on June 23, 1960, which constitutes the first record for this State and the only known specimen apart from the type.

Tympanocryptis cephalus gigas Mitchell

Tympanocryptis cephalus gigas Mitchell, 1948, Rec. S. Aust. Mus. 9: 65. Between Ashburton and Gascoyne Rivers, Western Australia.

Material examined. R 3990 (between Wells 40 and 43, Canning Stock Route); R 13363 (Jigalong); R 13640, R 17689 (Turee Creek); R 14060 (Wandagee); R 19111 ("Bernier Island"); R 13476 (20 miles S of Dongara); R 19099 (11 miles N of Mt. Magnet); R 13639 (Yalgoo); R 13991 (Paynes Find); R 19649 (Mt. Magnet); R 15802 (Belele); R 2006 (Meekatharra); R 7302 (Wiluna); R 1606 (Lake Wells); R 19770 (Albion Downs); R 1240, R 1242, R 1305, R 1360, R 1757-8, R 13323 (Laver-ton); R 20-1 ("Goldfields"); R 7067 (Grants Patch); R 3748 (Hampton Hill); R 4329, R 6542-4 (Kalgoorlie); R 6434-5, R 6754-5 (Kurarawang); R 2346 (Londonderry); R 19100 (10 miles W of Coolgardie).

Description. **Body much depressed. Neck much narrower than head, which is usually a little wider than long. Tail short, tapering rapidly.** Supraciliary ridge moderately acute and (viewed from above) bowed out but not concealing eye. Rostral ridge obtuse, swollen in front of nasal. Facial trough not deep or angular. Snout-vent length of largest specimen (R 6755) 57 mm.

Rostral about twice as wide as high, slightly narrower than combined width of first two labials, and considerably wider than the truncate elliptical mental which is usually deeper than wide. Upper labials 12-16, smaller than the facials immediately above them. Nasal situated immediately below rostral ridge, rounded polygonal, slightly convex, pierced a little above its centre by the small elliptical nostril which enters downwards and slightly forwards, and separated from labials by 5-6 rows of facials.

Scales on top of head rugosely tectiform or conical; largest and highest prefrontally, on temples, and around interparietal; smallest and lowest above supraciliary ridge and on mid-line between orbits. Scales on nape small and strongly imbricate, becoming larger and weakly imbricate or juxtaposed on back. **Dorsal tubercles** large, raised, **unkeeled**, trispinose (the central spine much the highest and sharpest) and **arranged side by side to form short transverse or oblique ridges**; the two kinds of tubercular ridge generally alternate down the back, the transverse ridges tending to be distant from the mid-line, and the oblique ridges close to it. The tubercles extend to base of tail, the remainder of its upper surface, like its entire under surface, being covered with uniform scales, their keels aligned longitudinally.

Scales on chin imbricate and weakly keeled. Ventrals weakly imbricate and keeled on chest, becoming smooth and juxtaposed on abdomen. Except at elbow and knee, scales on upper surface of limbs large, strongly keeled and mucronate, and mixed on fore-arm and thigh with

tubercles like those on back. Scales on lower surface of limbs similar to subcaudals. Scales on palms and soles small, strongly keeled, and spinose. Lamellae under fourth toe 16-18, bicarinate and bispinose, the outer keels and spines much the smaller and sometimes barely discernible. Claws strong and short. Two pre-anal pores in most specimens.

Dorsal ground colour brownish red. A dark reddish brown band across narrowest part of neck, sometimes broken by 3 short white longitudinal lines (one vertebral, two dorso-lateral). 8-11 dark bands across tail. The first caudal band, situated only a little behind level of vent, is transverse and has a sharply defined darker posterior edge. The next two bands are increasingly oblique (from above they appear V-shaped with the angle pointing backwards), similarly with a dark posterior edge, and separated from each other (as are the first and second bands) by a large whitish or pale grey space. The remaining caudal bands are more obscure and uniform in colour (i.e. not darkly margined) and tend to be broken and to extend to lower surface of tail. Limbs vaguely banded. Entire under surface whitish.

Distribution. Western Australia, from the Ashburton River drainage and the Great Sandy Desert south to Dongara, Paynes Find, and the vicinity of Kalgoorlie.

Comments. The above description is based on specimens from the Eastern Goldfields, the only region from which there is adequate material. Northwards, the following changes occur:

- (1) the head scales become lower and less rugose and tend to be simply unicarinate or smooth;
- (2) the head becomes narrower than long;
- (3) the tubercles become smaller, lower, less numerous and not so inclined to be arranged in definite and symmetrical patterns;
- (4) the nasal tends to move up on to rostral ridge.

North to at least the Ashburton, there is no geographical variation in colouring, apart from a tendency for the flanks to become dark grey, which may diffuse on to back broadly or in the form of vaguely transverse bands. The head may be similarly diffused with grey above orbits and temples.

Though the extreme populations are fairly distinct, they are connected by a chain of intermediates. Moreover, the various north-south clines seem to operate independently of each other and any division into two races would necessarily be arbitrary. Mitchell's concept of *gigas* is therefore broadened so as to include all populations south of the Ashburton.

Tympanocryptis cephalocephala Günther

Tympanocryptis cephalocephalus Günther 1867, Ann. Mag. Nat. Hist. (3) 20: 52. Nickol Bay, Western Australia (Duboulay).

Material examined. R 12495 (Mardie).

Distribution. A small sector of the north-west coast of Western Australia, west of Roebourne.

Comments. As nominate *cephalocephala* is only known from the two syntypes in the British Museum and from our R 12495, it is not possible

to give a full description of it. All that can be done at present is to show briefly how *cephalocephala* differs from the much better known *gigas*.

According to the original description, Boulenger (1885), and the photograph of a syntype (Mitchell 1948), nominate *cephalocephala* differs from *gigas* as follows:

- (1) the body is not so depressed, and the head is narrower
- (2) the dorsal tubercles are not (or not so markedly) arranged into warts
- (3) there are darker bands ("more or less indistinct") across the body
- (4) the caudal bands are separated from each other by much narrower interspaces.

The specimen from Mardie (only 60 miles south-west of the type locality) is very young (snout-vent length 26.5 mm) but seems essentially similar to the syntypes. It further differs from our series of *gigas* in having

- (1) more strongly keeled and imbricate ventrals (this is especially noticeable on the abdomen, where the scales show no tendency to become smooth and juxtaposed)
- (2) fewer lamellae (13) under the fourth toe, compared with 14-19, seldom fewer than 16, in *gigas*
- (3) much weaker spines on palms, soles and subdigital lamellae (indeed the last 2-3 lamellae are quite smooth).

In some characters, e.g., the relative smoothness of head scales and the position of the nostril with respect to the rostral ridge, typical *cephalocephala* is nearer to northern *gigas* than the latter is to southern *gigas*. In other characters, especially coloration, there is sharp enough break to warrant at least tentatively the recognition of the two races.

Measurements

The following measurements were made on all specimens: (1) total length, (2) length of tail, (3) snout-vent length, (4) length of hind-leg (including longest toe, without claw)—all to the nearest 0.5 mm; and (5) length of head (measured axially from snout to end of lower jaw) and (6) maximum width of head—both to nearest 0.1 mm. All these measurements were expressed as per cent. length of trunk (snout-vent length minus length of head), and the mean and standard deviation from the mean were calculated for each sample; with the exception of head width they are given in Table I. For the number of specimens examined in each taxon

TABLE I

Mean length of head, tail, fore-leg, and hind-leg, all expressed as per cent. length of trunk (with standard deviation in brackets).

	Head	Tail	Fore-leg	Hind-leg
<i>T. lineata</i>	40.2(4.2)	226.1(22.4)	59.3(4.5)	93.5(9.1)
<i>T. centralis</i>	37.7(2.4)	205.5(19.3)	55.8(3.4)	82.1(5.2)
<i>Tetraporophora</i>	37.5	216	63.3	101.7
<i>parviceps</i>	36.2(2.8)	196.2(21.6)	54.0(4.8)	99.4(7.5)
<i>uniformis</i>	42		58	85
<i>c. cephalocephala</i>	43	141	60	92
<i>c. gigas</i>	40.6(4.6)	175.6(18.9)	65.7(4.8)	92.3(6.9)

TABLE II

Number of specimens examined, mean length of trunk, ratio fore-leg to hind-leg, and ratio width to length of head (with standard deviation in brackets).

	Number of Specimens	Length of Trunk(mm)	Fore-leg as % of Hind-leg	Width of Head as % of its Length
<i>l. lineata</i>	15	36.4	63.6(3.3)	83.4(4.6)
<i>l. centralis</i>	18	34.9	67.1(2.7)	87.6(3.4)
<i>tetraporophora</i>	3	42.0	62.0	82.0
<i>parviceps</i>	19	28.8	54.3(3.0)	87.0(2.5)
<i>uniformis</i> ...	1	24	68	91
<i>c. cephalata</i> ...	1	18.5	65	100
<i>c. gigas</i>	36	29.3	70.6(3.3)	99.6(5.8)

see Table II, which also gives mean length of trunk and mean ratio length of fore-leg to hind-leg and width to length of head.

Tables I and II show that the *lineata* group (including *tetraporophora*) comprises larger and longer-tailed lizards than in the rest of the genus.

Despite its broken distribution (in isolated ranges surrounded by sandy deserts or otherwise unsuitable lowlands), *lineata centralis* exhibits remarkably little variability in the relative length of its appendages. In contrast, the more continuously distributed *lineata lineata* is highly variable in structure (probably exceeding in this respect *cephala gigas*, which undergoes marked clinal variation in several characters). However, *l. lineata* is much more uniform in coloration than *l. centralis*, which tends to lose its dorsal pattern from east to west.

Discussion

As illustrated by the map in Mitchell (1948, p. 58), the genus *Tympanocryptis* attains its greatest diversity in the Lake Eyre basin. In Western Australia, however, the several taxa tend even more than in *Nephrurus* (Storr 1963) to be allopatric. There is probably widespread sympatry only in the Kimberley Division (between *uniformis* and *tetraporophora*). Further collecting in the far east of the State may reveal the presence of *tetraporophora* within the range of *lineata*. Elsewhere the probability of sympatry is small. As *parviceps* is restricted to coastal dunes, it will at most only approach

the range of *cephala*, which alone represents the genus on the great Precambrian block from the Pilbara south to the Goldfields.

Since this study was begun it has become increasingly doubtful whether the genus *Tympanocryptis* is tenable as it is at present understood. As mentioned earlier, *parviceps* is in some important respects more like *Amphibolurus adelaidensis* than any *Tympanocryptis*. On the other hand, the 2-pored species of *Tympanocryptis*, especially the *lineata* group, are reminiscent of various species of *Diporiphora*.

The closure of the ear aperture has, perhaps, no great phylogenetic significance. At any rate, if *Tympanocryptis* is to stand, other characters should be found. The relatively small head cannot be reckoned an independent character, for it is almost certainly related to the atrophy of the ear, which in turn is probably connected with their small size and sedentary and cryptic habits. There thus remains at present only their tendency to spininess, which however is shared with such species of *Amphibolurus* as *adelaidensis* and *barbatus*. Indeed, the latter, with its extremely depressed body, differs from *Tympanocryptis* only in its larger size and the presence of an ear aperture.

The generic classification of Australian Agamidae has remained exactly as Boulenger left it in 1885, and a thorough and simultaneous revision of all Australian genera is long overdue. Since such a study has been planned by another worker, I have not pursued the matter further and have retained for the present *Tympanocryptis* in its traditional sense.

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